2026

CONFERENCE

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Individuals, Systems, and Health Behavior Change

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CBITN

Co-presented with the
Canadian Behavioural Interventions and Trials Network

www.ibtnetwork.org

1. Individual- and System-Level Change

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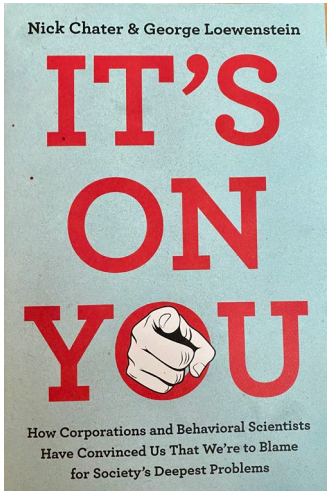
- "S-frame interventions involve changing the rules of the game; i-frame interventions attempt to modify the actions of the players, within the existing rules." (Chater & Loewenstein, 2022, p. 78)
  - Legislation (e.g., restriction, regulation) and fiscal policies (taxes, subsidies) appear to be key s-frame interventions

- Individual-level interventions target persons via persuasion, CBT, goal setting, nudges, or developing self-regulation skills
  - "[D]isappointing often, they yield small or null results" (Chater & Loewenstein, 2023, p. 2)



Chater & Loewenstein (2023) *Behav Brain Sci*

Are I-Level Behavior Change Interventions Efficacious?

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Authors	Outcome	Intervention focus	k	Years	*ES*
Sheeran et al. (2025a)	Exercise	All	866	1986-2019	*d* = 0.33
Mertens et al. (2022)	Diet	Nudges	111	1996-2019	*d* = 0.65
Mertens et al. (2022)	Multiple	Nudges	84	1987-2021	*d* = 0.34
Borek et al. (2018)	Weight	Group	54	1992-2017	*MD* = -3.49 kg
LeBlanc et al. (2018)	Weight	Behavioral	67	1991-2017	*MD* = -2.39 kg
Lemmel & Morina (2024)	Alcohol	Social norms	35	1995-2023	*d* = -0.08
Kaner et al. (2017)	Alcohol	Digital	42	1997-2015	*MD* = -22.84g
Kaner et al. (2018)	Alcohol	Brief	34	1988-2014	*MD* = -20.08g
Sheeran et al. (2025b)	Smoking	Motivational	172	1981-2023	*d* = 0.41
de Bruin et al. (2016)	Smoking	All	236	1996-2018	*d* = 0.14

- Are these effect sizes “small”?

Sheeran, Pei, & Rothman (2025) *Soc Sci Med*

Are I-Level Behavior Change Interventions (a) Efficacious, and (b) Improving Over Time?

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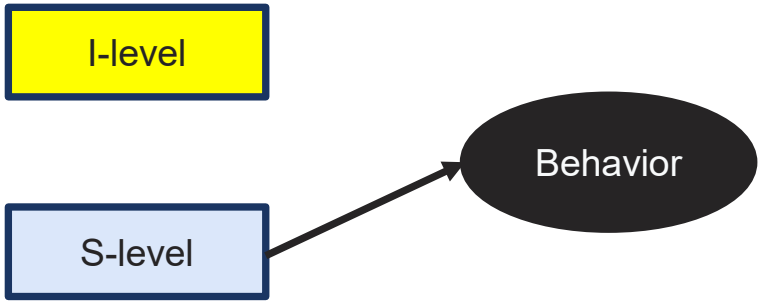
Authors	Outcome	Intervention focus	k	Years	*ES*	*Meta-Regression of ES on Year*
Sheeran et al. (2025a)	Exercise	All	866	1986-2019	*d* = 0.33	*p* = .88
Mertens et al. (2022)	Diet	Nudges	111	1996-2019	*d* = 0.65	B = -0.039, *p* = .001
Mertens et al. (2022)	Multiple	Nudges	84	1987-2021	*d* = 0.34	*p* = .34
Borek et al. (2018)	Weight	Group	54	1992-2017	*MD* = -3.49 kg	*p* = .33
LeBlanc et al. (2018)	Weight	Behavioral	67	1991-2017	*MD* = -2.39 kg	*p* = .056
Lemmel & Morina (2024)	Alcohol	Social norms	35	1995-2023	*d* = -0.08	*p* = .16
Kaner et al. (2017)	Alcohol	Digital	42	1997-2015	*MD* = -22.84g	B = -6.35, *p* < .001
Kaner et al. (2018)	Alcohol	Brief	34	1988-2014	*MD* = -20.08g	B = -2.32, *p* < .001
Sheeran et al. (2025b)	Smoking	Motivational	172	1981-2023	*d* = 0.41	*p* = .10
de Bruin et al. (2016)	Smoking	All	236	1996-2018	*d* = 0.14	*p* = .93

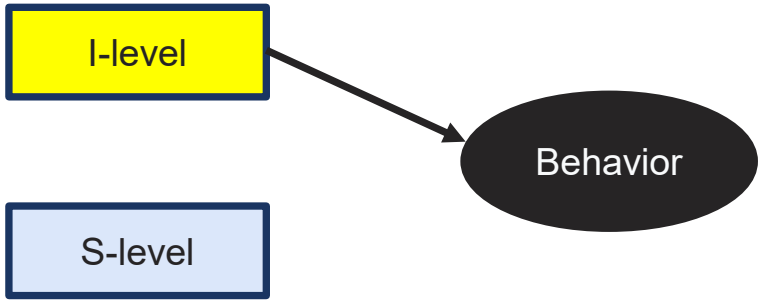
- Are these effect sizes “small”?
- Could system-level factors explain why i-level interventions are not improving?

Sheeran. Pei, & Rothman (2025) *Soc Sci Med*

Construing I- and S-Level Intervention Effects

1. Competition: One Level is Effective





Chater & Loewenstein (2023)

- I-level interventions are ineffective and crowd out support for S-Level change

Nobody

- S-level interventions are hypothetical magic bullets, evidence from simulations not RCTs

How Do I- and S-Levels Interventions Promote Behavior Change? Common Targets are Engaged

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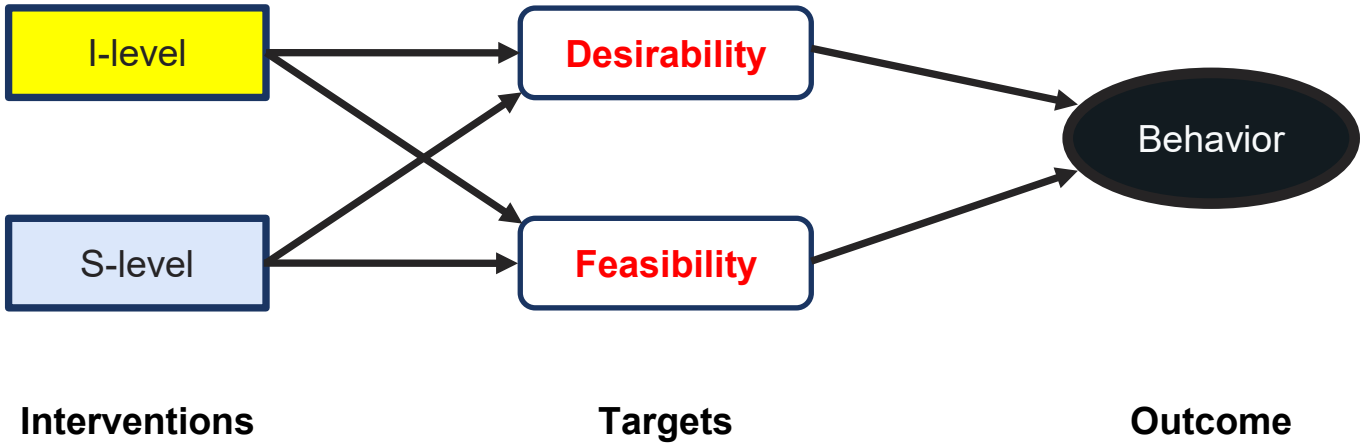
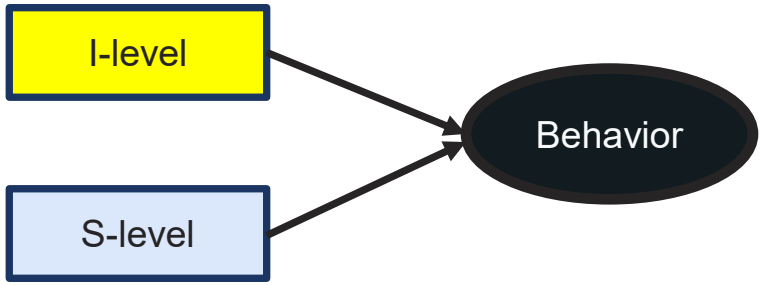


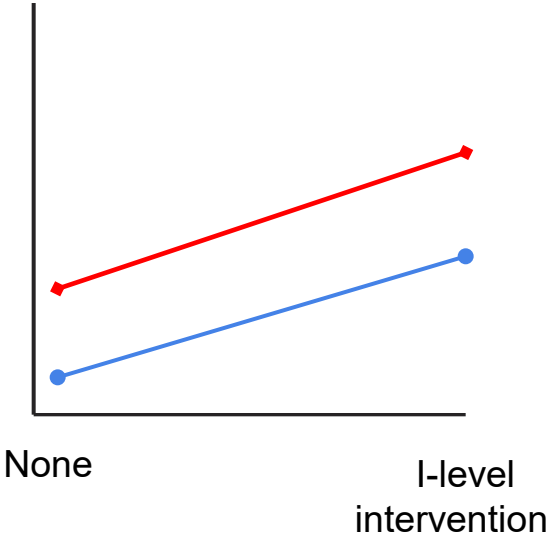
Sheeran et al. (2023) *Annals Behav Med*

Construing I- and S-Level Intervention Effects

2. Complementarity: Levels are Additive

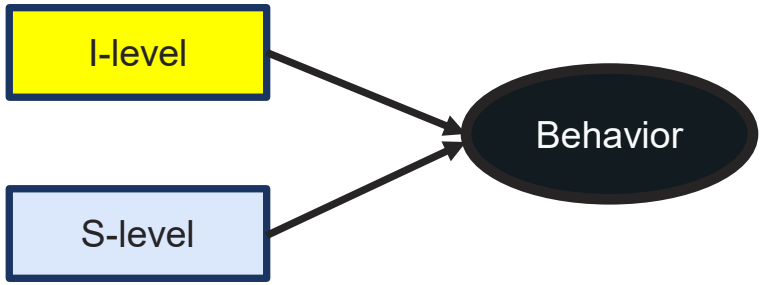


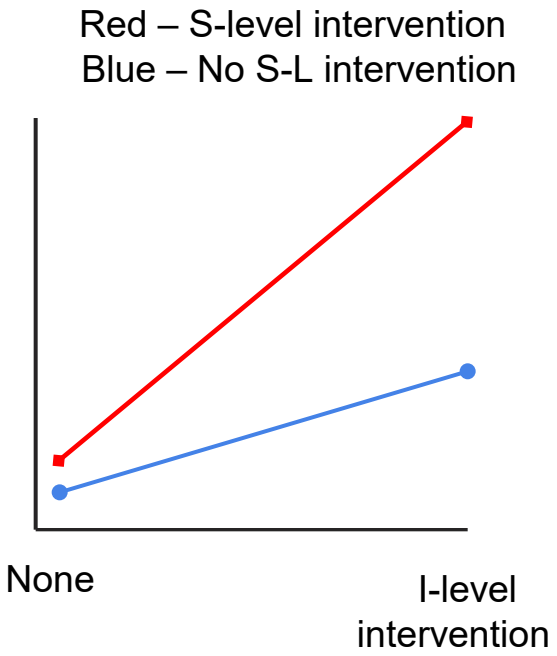
Red – S-level intervention
Blue – No S-L intervention



Construing I- and S-Levels of Change

3. Synergy: Levels Interact





Construing I- and S-Levels of Change:
4. Precondition: I-Level is Needed for S-Level Effects

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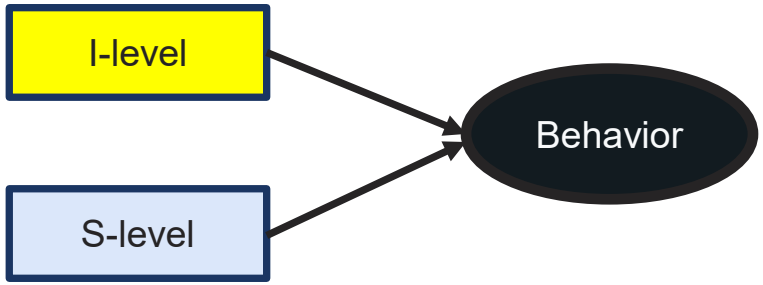

Red – S-level intervention
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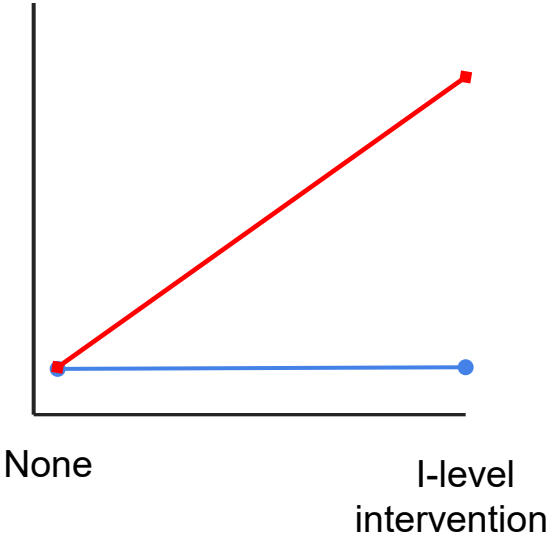

The Public's Role in Policy Change

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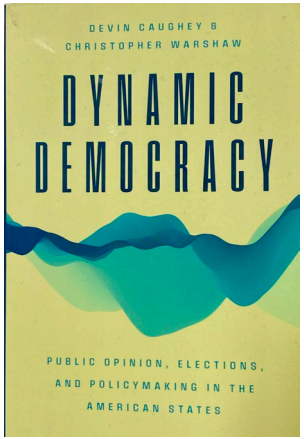
"Radical systemic change often comes from the bottom-up, as well as from top-down. Understanding which policies gather popular support … and how to design policies to maximize that support are key challenges." (Chater & Loewenstein, 2023, p. 82)



- "American democracy is far from perfect, and responsiveness can be painfully slow and halting, but over the long term the public does exert a powerful influence … over government policies" (p. 6)
- "… states are highly responsive to issue-specific opinion … the average policy in our data set matches opinion majorities about 60 per cent of the time, with proximity improving the longer policy has been on the political agenda" (p. 8)

- **Could behavioral medicine contribute to generating opinion majorities about salutary health policies?**

Tobacco Endgame Policies

(McDaniel et al., 2016)

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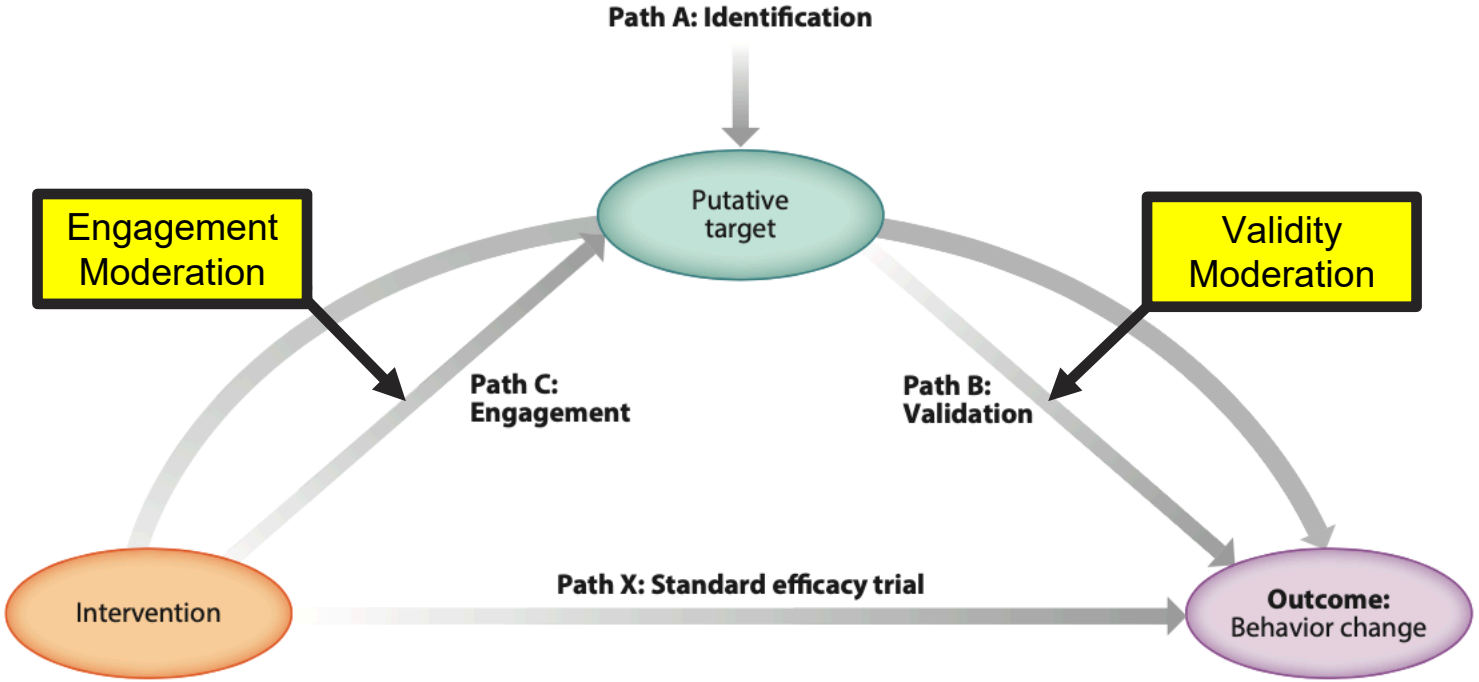
Policy focus	Example
Product	Reducing nicotine levels in cigarettes
User	Age gradient to buy cigarettes
Institutional structure	Tobacco companies must meet targets for reduced smoking prevalence or face fines
Market/supply	Taxes on combustible tobacco

The ultimate market solution is a ban on the sale and purchase of tobacco

-- ”*the simplest way to approach disease prevention and would obviate the need for most other solutions*” (Proctor, 2013, p. 556)

Support for Banning Cigarettes: The Operating Conditions Framework



Rothman & Sheeran (2021) *Health Psychol*

Path A: Identify Targets for Policy Support

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Targets
Harm prevalence
Harm severity
Attitude to smoking
Effectiveness of ban
Reactance to prohibition
Trust in government
Nicotine dependence

Protection motivation theory, prior research

Avishai, Ribisl & Sheeran (2023, Study 1) *Soc Sci Med*

Path B: Validate Targets for Different Groups

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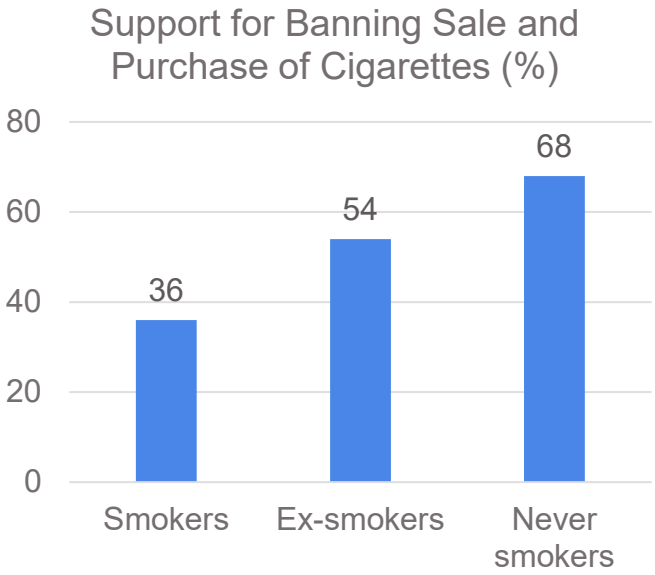
Targets	Smokers	Ex-smokers	Never smokers
Harm prevalence	1.01	0.99	1.01
Harm severity	0.98	1.08	**0.85**
Attitude to smoking	.28	.34	1.25
Effectiveness of ban	**2.45**	**1.65**	**2.00**
Reactance to prohibition	**0.46**	**0.47**	**0.22**
Trust in government	1.00	1.34	1.57
Nicotine dependence	.82		

Avishai, Ribisl & Sheeran (2023, Study 1) *Soc Sci Med*

N = 479, Mturk. 57% women, 22.3% minority race. Values are odds ratios

Step 3: Engage Targets to Promote Policy Support



Study 2: Persuasive Communication Intervention

- People who smoke (*N* = 300), MTurk, 62% women, 19% minority race.

➢ ***No or negative difference in targets, no change in support***

Study 3: Paradoxical Thinking Intervention

- People who smoke (*N* = 302), MTurk, 58% women, 15% minority race.

➢ ***No or negative difference in targets, no change in support***

Avishai, Ribisl & Sheeran (2023, Studies 2-3) *Soc Sci Med*

Step 3 (Again!): Self-Persuasion Intervention

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Study 4: Self-Persuasion Quiz

- What is the percentage of smokers who wish they'd never started smoking?
- If a smoker tries to quit on their own, what is the chance that their quit intention will be successful?
- Why is it so difficult for smokers to quit? What did tobacco companies do to get and keep smokers addicted:
  - ❑ Increased the amount of nicotine in cigarettes
  - ❑ Added ammonia to cigs so nicotine moves to the brain faster
  - ❑ Added chemicals called *bronchodilators* so that smoke can enter the lungs more easily
  - ❑ Added sugars and flavors to reduce the harshness of cigarette smoke so it's easier to inhale

Participants were given the correct answers at the end of the quiz

Avishai, Ribisl & Sheeran (2023, Study 4) *Soc Sci Med*

Self-Persuasion Effects on Targets and Outcome

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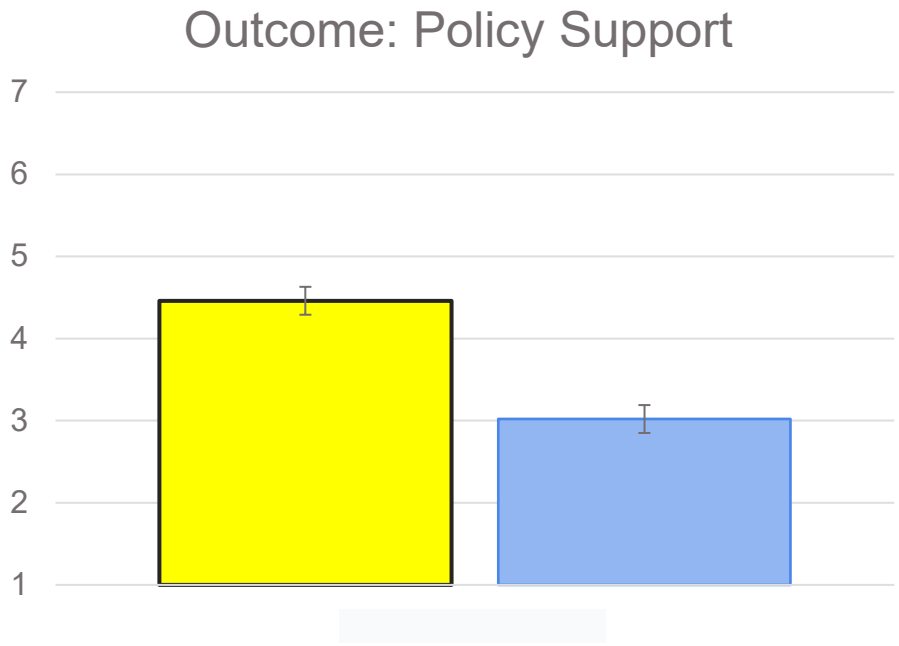

Self-persuasion Control

Avishai, Ribisl & Sheeran (2023, Study 4) *Soc Sci Med*

Policies for Specific Behavioral Issues vs. Policies for Social Determinants of Health

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- Chater & Loewenstein (2023) did not discuss social determinants of health or health disparities in the context of system-level interventions

Historical Enslavement and Racial Disparities in Contemporary Mortality

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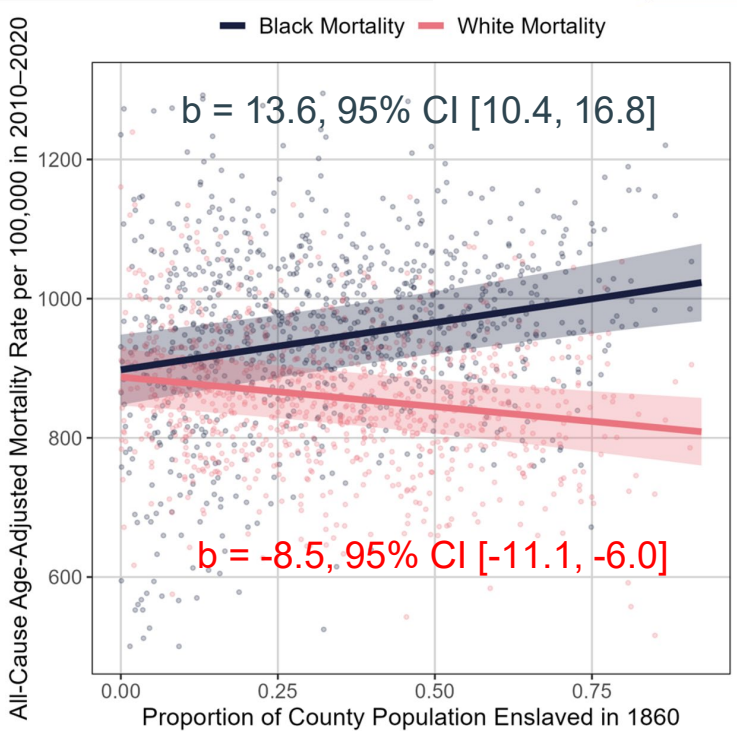
Combined two databases for 1,169 US counties:

- *CDC Wonder database*: All-cause age-adjusted mortality rates per 100,000 population (2010-2020)
  - Mean rates for Black & White Americans are 974 and 894, respectively, $p < .001$
- *1860 Census*: Rates of enslavement in each county, where proportion > 0

MLM controlling for counties within states *inter alia*



Galvan, Payne, Muscatell, Rucker, & Sheeran (under review)

How Enslavement Relates to Contemporary Health Disparities

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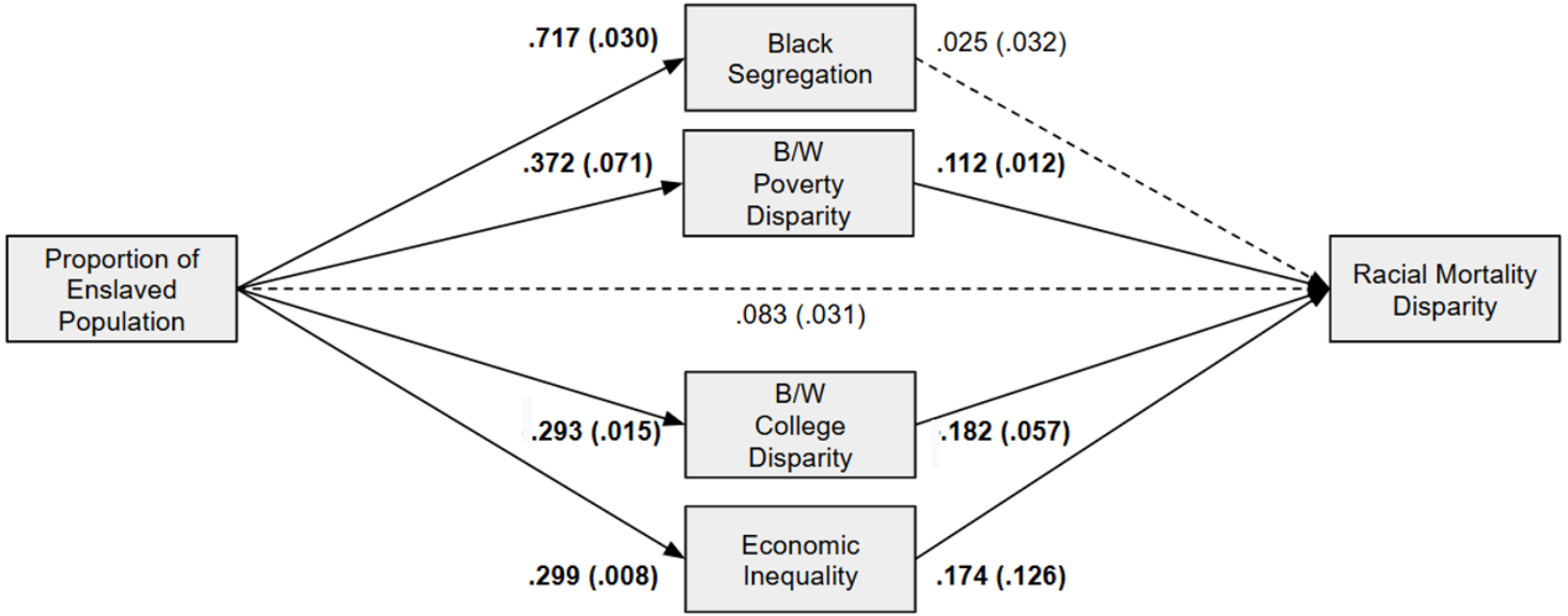

1860 **~ 2000** **2010-2020**

Reparations as a Public Health Policy

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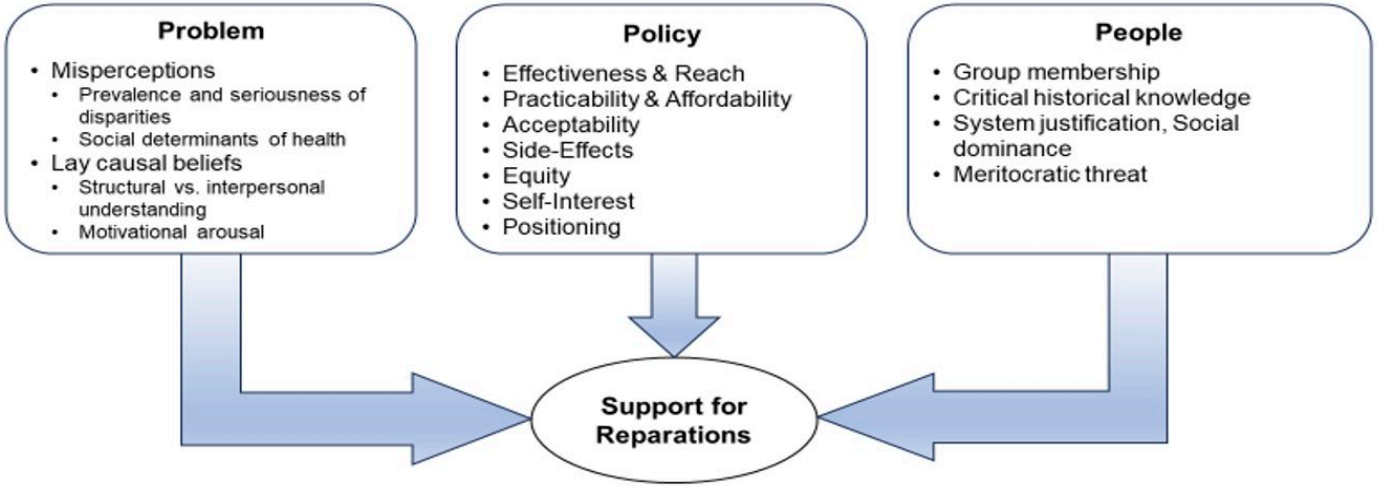
- Reparations for enslavement could help reduce the inequities in poverty, education, and economic opportunity at the root of Black-White health disparities
  - And reduce psychological strain and have intergenerational benefits (Bassett & Galea, 2020, *NEJM*)
- Much research remains to be done:

Identify and Validate Targets of Support for Reparations: *P3 Model*



Rucker, Wallace, & Sheeran (in prep)

System-Level Change via I-Level Interventions

- Most contemporary behavioral medicine research (BMR) is concerned with understanding health actions and testing individual-level interventions

- BMR could contribute to system-level change by
  - Treating public attitudes toward health policies as an important topic for research
  - Developing and testing interventions to mobilize support for salutary health policies
    - The Operating Conditions Framework (Rothman & Sheeran, 2021) could offer a useful vantage point

Judging Interventions' Efficacy

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Compare treatment vs. control arm in the individual trial using

- ***Null hypothesis significance tests (NHST)****:* reject the null hypothesis ($p < .05$)
  - Dichotomous: significant/not, effective/ineffective
  - "Surely God loves the 0.06 as much as the 0.05" (Rosnow & Rosenthal, 1989)
  - *p*-values are confounded by sample size

- ***Effect sizes****:* trichotomous conventions for 'small,' 'medium,' and 'large'
  - Cohen (1992): small ($d = 0.2$), medium ($d = 0.5$), large ($d = 0.8$)
  - Funder & Ozur (2019): very small ($d = 0.1$), small ($d = 0.2$), medium ($d = 0.4$), large ($d = 0.6$), very large ($d = 0.9$)
  - "Surely God loves 0.1 as much as 0.2" (Sheeran, 2026)

➢ **These evaluation approaches are arbitrary and do not indicate progress**

Intervention Benchmarking

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- Benchmarks enable us to compare an intervention relative to interventions that came before – and thus track changes in efficacy
- Benchmarking involves a quantitative synthesis that generates the distribution of effect sizes across trials
  - Because ES is based on the difference between treatment and control arm, we need the rates of behavioral performance in both conditions
- **Evidence:** Literature searches identified 187 RCTs to promote colorectal cancer screening (CCS). We computed
  - The effect size (*OR*) at every 10th percentile in the distribution, plus
  - The CCS rate for the control arm
  - The CCS rate for the treatment arm
  - The differential screening rate (intervention minus control)

Sheeran, Frisch, Listrom, Pei, Bermudez, Rothman, & Smith (2025) *Health Psychol*

Distribution of Effect Sizes and Screening Rates in CCS Interventions

Percentile	Odds ratio		Screening Rates (%)	
		Control	Treatment	Differential
10	1.009	13.10	16.60	+0.20
20	1.044	14.50	18.30	+1.00
30	1.212	21.00	24.10	+2.50
40	1.276	30.40	30.60	+3.80
50	1.320	34.70	35.70	+5.90
60	1.467	36.20	39.70	+7.60
70	1.467	38.10	52.50	+8.44
80	1.487	62.78	67.00	+8.44
90	2.361	62.78	71.22	+16.20

Sheeran, Frisch, Listrom, Pei, Bermudez, Rothman, & Smith (2025) *Health Psychol*

Using Benchmarking to Evaluate the Effectiveness of Interventions

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Benchmarking

- Focuses attention on the ***relative efficacy*** of interventions (not $p < .05$!)
- Offers precise, quantitative estimates of effectiveness (e.g., "*My intervention is on the 85th percentile!*")
  - Benchmarks can be generated for different samples, measures, and context
- Helps to calibrate expectations about the magnitude of effects

Magnitude	Convention *d*[1]	Observed *d*[2]	Convention *OR*[3]	Observed *OR*[4]
"Small"	.20	.16	1.69	1.08
"Medium"	.50	.21	3.47	1.32
"Large"	.80	.30	6.71	1.47

1. Cohen (1988) *Statistical Power Analysis for Behavioral Sciences;* **2.** Wright, Rhodes, Ruggiero, & Sheeran (2021) *Health Psychol*
3. Chen, Cohen, & Chen (2010) *Comm Stat;* **4.** Sheeran, Frisch, Listrom, Pei, Bermudez, Rothman, & Smith (2025) *Health Psychol*

Using Benchmarking to Evaluate the Effectiveness of Interventions

Benchmarking

- Offers precise, quantitative estimates of effectiveness (e.g., "*My intervention is on the 80th percentile!*")
  - Benchmarks can be generated for different samples, measures, and contexts
- Helps to calibrate expectations about the magnitude of effects
- Provides useful data for healthcare systems and policy makers
  - Puts effectiveness on the same quantitative footing as cost and reach
- Permits estimates of effectiveness when NHST is not feasible
- Enables consideration of rates of behavioral performance in control conditions
- Allows alternatives to NHST (e.g., minimal effects testing), and could facilitate Bayesian tests of intervention effectiveness

Conclusion

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- System-level interventions are essential for increasing health behaviors and improving social determinants of health
  - Individual-level research can complement or synergize s-level work, and could contribute to the realization of s-level change
  - Mobilizing opinion majorities is likely one of many i-level approaches to promoting s–level change
  - Research is needed on different policies (fiscal vs. legislative) and issues (alcohol, vaccination, screening, etc.)
- I-level research needs to do better over time. Benchmarking could help us to monitor intervention efficacy over time
  - Focus research attention on *increasing* efficacy
  - Help forge a more cumulative science of behavior change

Thanks to My Collaborators!

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Alex Rothman

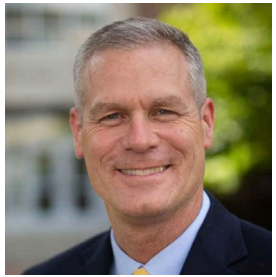
Aya Avishai

Julian Rucker

Keith Payne

Andrea Bermudez

Yifei Pei


Kurt Ribisl

Deshira Wallace

Caroline Frisch

Jennifer Smith

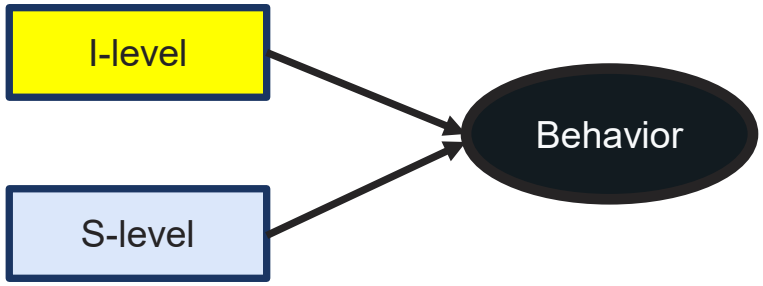
Olivia Listrom

Manuel Galvan

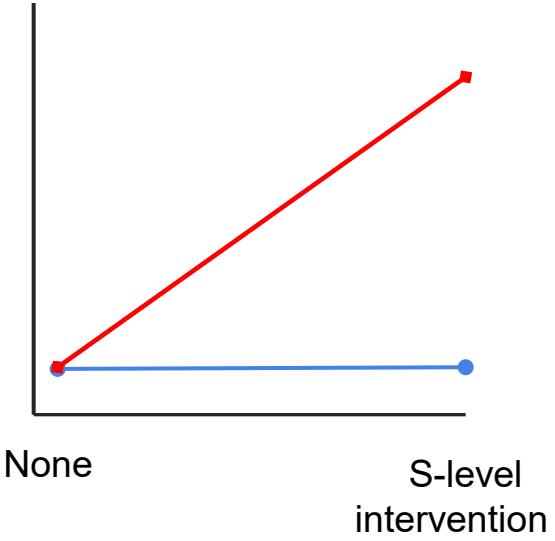
and Thank You for your kind attention!

Fin

Construing I- and S-Levels of Change:
4a. S-Level is a Precondition for I-Level effects



Red – I-level intervention
Blue – No S-L intervention



Percentile Distribution of Effect Sizes and Impact in Physical Activity Interventions

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Percentile	*d*	Steps per day	MVPA mins/day	Meet WHO guidelines (%)
10	.12	736	8.7	2.4
20	.16	1,006	11.9	3.3
30	.19	1,169	13.8	3.8
40	.19	1,195	14.1	3.9
50	.21	1,320	15.6	4.3
60	.24	1,509	17.8	4.9
70	.26	1,635	19.3	5.3
80	.32	2,012	23.8	6.5
90	.35	2,201	26.0	7.1

Wright, Rhodes, Ruggiero, & Sheeran (2021) *Health Psychol*